

# Internship subject : Theoretical and/or numerical modeling of copepods in natural environment.

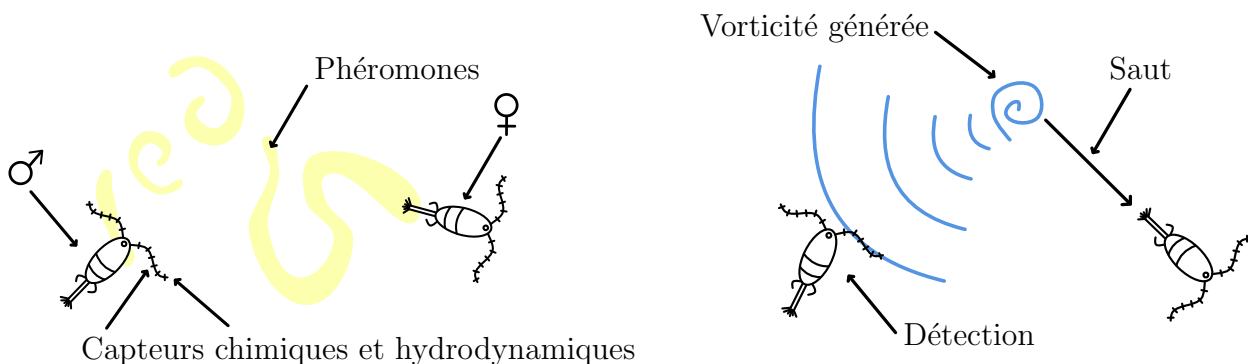
## Details

- Income : 568,76 €/ month
- Duration : 6 month
- Lab : IRPHE, 49 rue F. Joliot Curie - 13013 Marseille
- Contact : Tommaso Redaelli, PhD student
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- Reference Professors: Christophe Eloy, Benjamin Favier

## Description

There is an enormous amount of copepods living in the Oceans. Even being blind, they manage to find their bearings in the oceanic turbulent environment thanks to hydrodynamic and chemical sensors. Endowed with only 1000 neurons and advected by the flow, these animals arrive anyway to find their partners to reproduce, to detect their predators to flee them and to detect their prey to eat them. How do they do ? Which strategies do they follow to deal with turbulence and to optimize their research?

Especially in the case of reproduction, females release a trail of pheromones that males seek to follow to reproduce. This drag is likely to be broken and distorted by the surrounding turbulence, which makes males' task very hard.



**Schematic representation of Copepods**

## Objectives

Among the goals that need to be achieved in this project: to determine which methods are using males for their tracking of pheromones; to understand how their hydrodynamic detection works to localize their partners and their predators.

In order to answer these questions, will use digitally modeled copepods through reinforcement learning, embedded in a simulated turbulent environment.

Depending on the preferences of the candidate, the internship may relate to one or other aspect of this work: fluid simulation, genetic algorithms, neural networks, fluid-copepods interactions, theoretical fluid mechanics.

### **Requirements**

Priority will be given to candidate with knowledge in fluid mechanics, biomechanics, computer science and information theory and with a strong interest for interdisciplinarity, theoretical and numerical work.

The project will be carried out in an international community, so the English language will be very regularly used.

### **Candidate**

The candidate must communicate at least a Curriculum Vitae, and his transcripts of Master 1 and / or 2 or equivalent to the following address : **tommaso.redaelli@centrale-marseille.fr**.